DIZZINESS, INCLUDING MENIERE'S
DISEASE
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ZINESS, INCLUDING MENIERE'S
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Joe McCullough

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(Pwn 66.841. — T436 1962)

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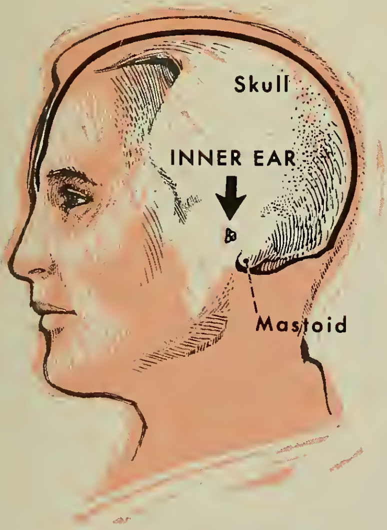
Dizziness

author: U.S. Dept. of Health, Ed. & Welfare

hope through research

What is dizziness?

Dizziness is a sensation almost everyone has experienced some time in his life. He feels unsteady, or that he is whirling around or the world is whirling around him. Some people experience dizziness more often than others. The explanation could be simple, such as looking down from a tall building or having a plane dip suddenly to one side in preparation for landing. However, when the sensation comes repeatedly without a recognized cause, a person is wise to discuss the problem with his physician.



The inner ear lies within the skull.

Otologist inspects the outer ear through an otoscope.

Many people who visit their doctor because of dizziness are told that the cause is a mild infection of the inner ear. Usually the doctor prescribes an antibiotic and in a few days the sensation of dizziness disappears.

Sometimes the doctor finds that the cause is more complicated and the needed treatment must be more extensive. Often the family doctor prescribes the treatment, but at times he may refer the patient to a specialist—an otologist (ear specialist), an otolaryngologist (ear, nose, and throat specialist), a neurologist (a specialist in diseases of the nervous system), or other specialists.

Although there are no official statistics on dizziness, studies showed that in about 85 percent of the patients whose chief complaint was dizziness, the cause lay in the inner ear. About one-fourth of these had an ailment called Meniere's disease, according to a grantee of the National Institute of Neurological Diseases and Blindness (NINDB). This research Institute is one of the National Institutes of Health of the Department of Health, Education, and Welfare.

The remaining 15 percent who suffered from dizziness were found to be suffering from a problem of aging of blood vessels referred to as arteriosclerosis; an allergy or sensitivity to drugs or various poisons; an injury to the ear; or other neurological disorders.

The human balance system

Three systems work together in the healthy person to provide the sense of balance: the inner ear's balance centers, the eyesight, and the muscle sense of position. All three systems report to the brain centers for equilibrium which integrate these messages and start appropriate muscle action to maintain balance. Also involved in balance are the "outside" senses in the skin, such as those to recognize pressure on the soles of the feet and air pressure against the body from running or wind.

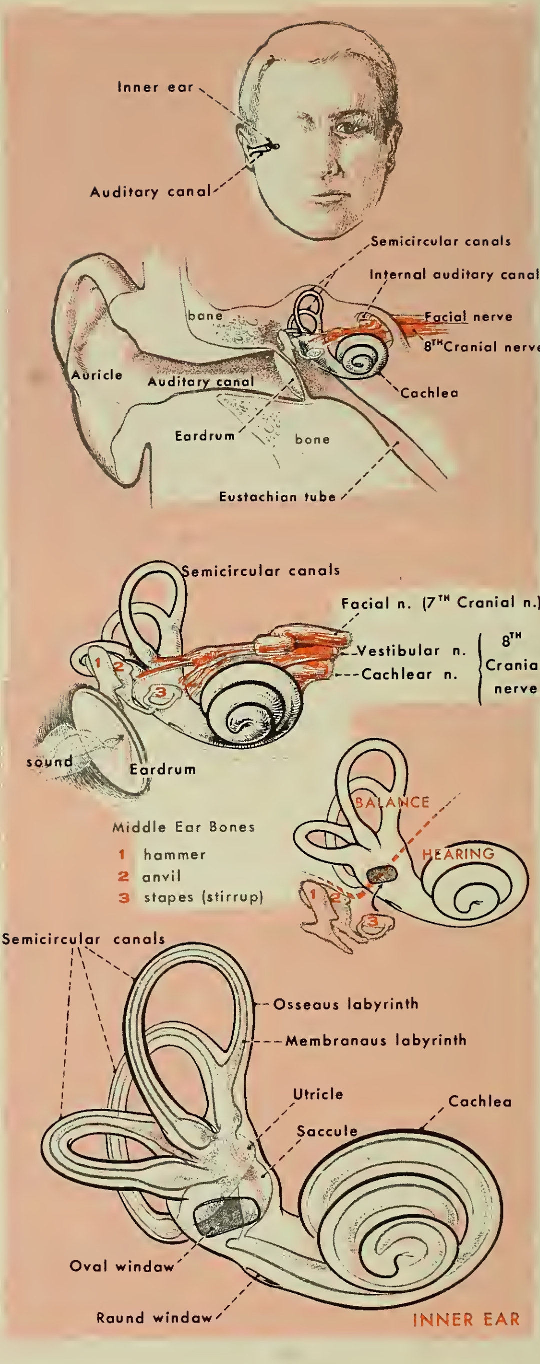
Older persons, particularly, should allow time for their inner ear balance and their blood circulation to adjust to any change of position, especially from lying down or sitting to standing and walking. Otherwise they may become dizzy and fall.

Dizziness and the inner ear

Patients are sometimes curious about terms their doctors may use in treating them for dizziness involving the inner ear (*labyrinth*). The labeled drawings of the inner ear (see drawing) provide an explanation.

The fluid-filled inner ear is about the size of a lima bean. It nestles within the hardest bone in the body, in front of the more familiar mastoid area. Any inflammation or change of pressure within this closed fluid system often affects both the balance and hearing portions.

The upper portion contains the nerve endings for balance and consists of three *semicircular canals* and the *vestibule*. A healthy *vestibular nerve* helps a person to recognize his position and


Inner ear
Auditory canal
Semicircular canals
Internal auditory canal
Facial nerve
8TH Cranial nerve
bone
Auricle
Auditory canal
Cochlea
Eardrum
bone
Eustachian tube
Semicircular canals
Facial n. (7TH Cranial n.)
Vestibular n.
Cochlear n.
8TH Cranial nerve
1
2
3
sound
Eardrum
Middle Ear Bones
1 hammer
2 anvil
3 stapes (stirrup)
BALANCE
HEARING
1
2
3
Semicircular canals
Osseous labyrinth
Membranous labyrinth
Utricle
Saccule
Cochlea
Oval window
Round window
INNER EAR

maintain his balance, even in the dark or when swimming under water.

The lower and inward portion contains the nerve endings for hearing within the *cochlea.* The function of the *cochlear nerve* is to carry sound impulses. If the nerve is irritated it can produce only ringing in the ears (tinnitus), or sensitivity to loud sounds.

Although they are separate nerves, the vestibular nerve for balance and the cochlear nerve for hearing together are called the *eighth cranial nerve.* They turn around each other as they travel between the inner ear and separate areas in the brain. Hence any damage to one is likely to affect the other. Traveling beside them for a short distance is the *facial nerve* (*seventh cranial nerve*), which adds another hazard in some inner ear ailments.

Tests of inner ear function

Tests of the sense of hearing and sense of balance provide information which guides the physician in diagnosis and treatment of dizziness and other inner ear ailments.

First, the physician inspects the outer ear canal through an otoscope. This enables him to see wax or any foreign bodies, any malformation, or any disease process. Next come two classes of tests: of hearing and of balance.

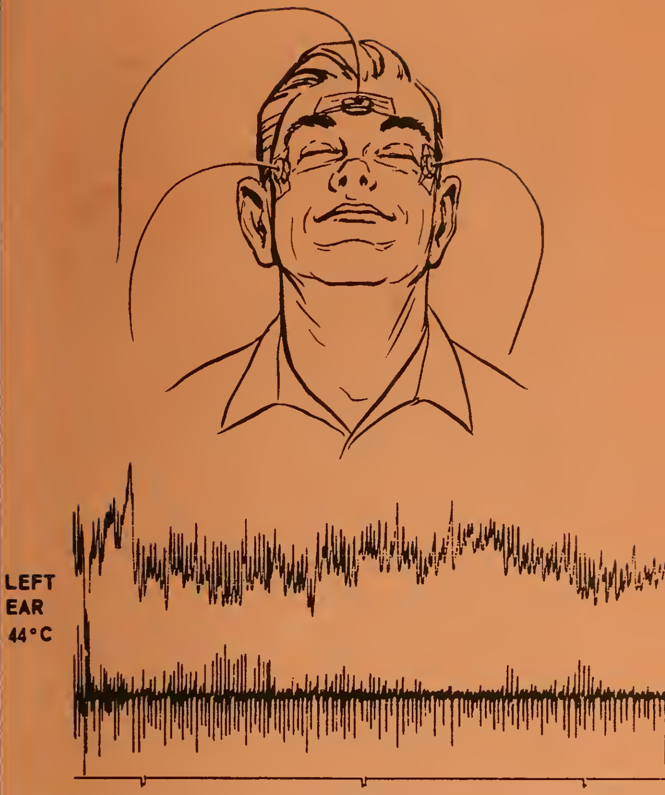
Tests of hearing (cochlear function) may be performed by an ear specialist (otologist or otolaryngologist), the family doctor, or an audiologist. Some are simple, such as listening to a watch or a tuning fork. Some are extremely complex, involving various kinds of electronic equipment. An audiogram is a chart of the hearing, showing any loss for various pitches or degrees of loudness. The kind of deafness sometimes relates to the kind of dizziness and its treatment.

Studies of eye movement in research on dizziness.

Since the treatment differs radically for different kinds of hearing loss, specialists are calling for more exact measurements from more precise tests.

Tests of the balance center of the inner ear (semicircular canals and vestibule) are performed by an ear specialist, a neurologist, or a family doctor. These tests are increasing in number and improving in usefulness.

In the *caloric test* (Barany test), the physician irrigates the external ear canal with hot or cold water. If inner ear function is normal, nystagmus (eye movement) occurs temporarily. If the inner ear is diseased, usually less than normal eye shifting or none occurs; but in some irritative



For a nystagmogram, electrodes are pasted to the outer corner of each eye and a ground electrode is pasted to the forehead.

conditions, the nystagmus is considerably increased. A different type of nystagmus may suggest a disorder in the central nervous system.

Nystagmography is a painless test for observing the movement of the eye by recording the electrical activity of the eye muscles. A *nystagmogram* is the written tracing made of these electrical impulses. These recordings allow the physician to make a careful analysis following the test, providing an aid in diagnosis of inner ear function.

Ear infection and labyrinthitis

When a physician finds that infection is causing dizziness, he directs his efforts at clearing up the infection. This offers the best chance to relieve the dizziness, often in a few days with prompt medical care.

In spite of available methods of clearing up a middle ear infection with antibiotics or surgery, people too often neglect an earache or a running ear. This creates a hazard to the adjoining inner ear (labyrinth). If infection breaks through into the balance portion of the labyrinth, dizziness is a symptom of the resulting *labyrinthitis.* If the infection spreads to the hearing portion of the inner ear, it may greatly damage the hearing. Labyrinthitis may occur without any warning earache.

An irritative labyrinthitis following an accident, a fall, or a blow may last for many months, causing prolonged dizziness and even nausea. Whatever the cause of labyrinthitis, regular supervision by a physician is important, as the symptom of dizziness is a warning that something is wrong.

Meniere's disease

When a doctor finds that the cause of dizziness is Meniere's disease, he is recognizing an ailment which was only described in 1861. An observing French physician, Prosper Meniere, noted that three symptoms often occur together: ringing in the ears (tinnitus), dizziness (vertigo), and loss of hearing on one side. He believed the symptoms originated in the inner ear. Because one of the commonest inner ear ailments presents all three symptoms which he described, the ailment came to be called after him, *Meniere's disease.*

The name many specialists prefer today, *labyrinthine hydrops,* describes the location (the labyrinth or inner ear) and the probable inner ear change (hydrops or dropsy or accumulation of fluid). Sometimes *endolymphatic hypertension* is used to describe the kind of fluid (endolymph of the inner ear) involved.

Although the ailment occurs rather frequently in men and women between the ages of 30 to 60 years, the cause still defies researchers.

An occasional earliest symptom is a "full feeling" or deep pressure in the affected ear. The most disagreeable symptom in Meniere's disease is an abrupt attack of severe, moderate, or mild dizziness, lasting from minutes to hours, and often complicated by vomiting, hearing loss, and ringing in the ears. This acute attack will stop without treatment. A period without dizziness and nausea (a "remission") follows, during which some patients experience temporary or permanent hearing loss of the nerve-deafness type, and tinnitus.

Attacks may recur several times a year, at unpredictable intervals, or they may become less frequent and even disappear in time. Meniere's disease is not fatal.

First in importance is a diagnosis by a general physician confirmed by an ear specialist (otologist or otolaryngologist). A careful history and various tests lead to the diagnosis of Meniere's disease. The hearing tests often reveal nerve deafness in one ear, or more severe hearing loss in one ear if both ears have a partial loss. Tests may show an unusual increase in sensitiveness to increasingly loud sounds, called "recruitment." Another symptom which tests may confirm is hearing the same sound at different pitches by the two ears, called "diplacusis." Where present, this symptom produces conflicting sounds in music, called "disharmonia."

Next follows a trial of medical treatment. No presently used medicine for treatment or prevention is always effective. However, relief is possible for many patients through medicines to suppress the dizziness or sometimes to control any excess fluid in the inner ear.

Any emotional stresses which might trigger attacks are discussed. In the diet, salt may be restricted, and advice given to omit coffee, tobacco, and alcohol. The sudden severity of the attacks sometimes makes driving a car unsafe.

Surgery is considered only when the attacks are severe, frequent, and uncontrollable by presently known medicines. Surgery usually relieves the symptom of dizziness, but sometimes any remaining hearing in the operated ear is lost. Researchers continue to improve the various kinds of surgery for Meniere's disease.

Why is care by a doctor important? Granted that acute attacks of Meniere's disease will end without any treatment, and that no known treatment is effective for every patient, why are early diagnosis and regular checkups by a physician important? Two reasons are outstanding. First, the sudden onset of severe attacks interferes with work and social life, and creates a hazard around machinery. Second, without treatment the fluctuating hearing loss eventually becomes permanent nerve deafness.

Head noises or tinnitus

Probably the commonest complaint of patients which relates to the ear is the symptom of *tinnitus* (ringing in the ears or head noises). The possible causes are many and often cannot be determined. In the main, tinnitus is not a warning of serious disease, but a physician is the person to decide for the individual patient. After completing a history and examination, the physician may recommend that his patient avoid any drugs (such as aspirin, quinine, and some others) which cause ringing in the ears of some persons. The doctor also may advise his patient to avoid stimulants (coffee, smoking, anxiety, and overfatigue), and any foods which cause allergies in his patient.

Tinnitus has a habit of disappearing after a period of time. Where it persists in spite of medical care, a patient can learn to improve his endurance of head noises. Some persons have been helped by deliberate nonchalance, relaxation, and masking of tinnitus by pleasant interests, enjoyable sounds, or a hearing aid if recommended by the physician. A clock-radio which will turn itself off helps cover head noises while the patient falls asleep.

Tumors causing dizziness or deafness

A tumor which squeezes or destroys the eighth cranial nerve (acoustic nerve) is an uncommon but important cause of loss of hearing (nerve deafness type) or noise in one ear, sometimes also with dizziness. The hearing loss is gradual but might be suddenly discovered because hearing is normal in the other ear. If a tumor has merely squeezed the blood supply to the ear, removal of the tumor may restore hearing. The kind of tumor which is composed largely of nerve cells and nerve fibers is a *neuroma.* When it involves the nerve of hearing or balance it is called an *acoustic neuroma.*

In acoustic neuroma, early surgery sometimes preserves or actually improves the hearing. If a section of the nerve has to be removed in order to remove all the tumor and save the patient's life, the function of the nerve is lost.

The need for early diagnosis is obvious, especially since early and complete removal of the tumor leads to permanent cure. A ringing noise might be the first symptom. Any unusual headache, any loss of hearing, any peculiar or continued dizziness, call for medical decision. Worry increases dizziness and ear noises, and delay allows the tumor time to grow. Turning the problem over to a physician and the specialists he recommends brings peace of mind and the best possible preservation of health.

Research already has provided earlier methods of diagnosis of tumors and improvements in surgery, and will continue to bring the cooperating patient even newer discoveries.

PROGRESS THROUGH RESEARCH

Hope for the future

Research holds the hope for many conditions which have not yet responded to treatment. An outstanding success story for research is an operation by which more than 90 percent of suitable patients with middle ear deafness may have their hearing benefited. When overgrowth of bone (otosclerosis) immobilizes the tiny stapes bone in the middle ear, incoming sound waves no longer can vibrate through this bone. A va-

The tiny human stapes carries sound waves to the inner ear.

riety of operations developed by researchers can correct this block to hearing.

The next great need of ear research is prevention and treatment of inner ear (nerve) deafness and the frequently related dizziness. Already steps in that direction are being made by researchers.

For example, prevention of nerve deafness due to German measles (rubella) in the infant's mother early in pregnancy was moved forward significantly with the isolation of the German measles virus. Research is proceeding actively toward the goal of a vaccine for German measles. Such deafness could then be avoided if all young girls and women were vaccinated before becoming pregnant.

To increase research progress, the training program of the National Institute of Neurological Diseases and Blindness (NINDB) is providing more investigators in otolaryngology (science of the ear, nose, and throat), audiology (study of hearing), and sensory physiology. This program has continued to grow since its beginning in 1957. Many of the early trainees are now directing both teaching and research programs of their own.

Examples of research

One study by NINDB grantees proposes to determine the degree to which tests of hearing can identify areas of damage in the hearing center of the brain. Particular attention in a closely related study will be paid to locating tumors of the hearing system, so that earlier surgery will provide a greater opportunity for cures.

New research approaches to study of the inner ear at the Institute and elsewhere have practical applications. The degree of development of the unborn child's inner ear relates directly to the hazard of hearing loss if the pregnant woman suffers a virus infection or is given certain medicines. More knowledge is being sought about the kinds of damage to the inner ear which medicine, accident, noise, and aging can cause.

Babies and children are studied

One of the big NINDB projects is the study of some 60,000 mothers and their offspring. The Institute is cooperating with 14 medical centers throughout the Nation in collecting and analyzing detailed information. This provides another approach to research on the effects of virus and drugs on the inner ear, as part of the overall study of influences before, during, and shortly after birth. The children will be followed until 7 years of age or older; if any ailment is found in the child, search of records of the mother may help to locate the cause.

Temporal bone banks

More than 40 cooperating temporal bone bank laboratories are offering persons with medical records of deafness and dizziness an opportunity to contribute after death to research. They may

bequeath their inner ears for kinds of research which cannot be performed while the donor is living. From a single pair of inner ears, slides prepared for microscopic study go to many research workers. The studies which follow will help the donor's fellowmen, perhaps even some of his relatives. The Temporal Bone Banks Program for Ear Research is sponsored by The Deafness Research Foundation and the American Academy of Ophthalmology and Otolaryngology. The program is being aided by grants from NINDB. For further information, talk to your ear specialist or write to The Deafness Research Foundation, 366 Madison Avenue, New York, N.Y. 10017, which aids all major areas of ear research.

Broad research programs

Five major clinical research programs are supported by NINDB at nongovernmental research centers for intensive and many-sided approaches to problems involving the ear. Research methods include basic studies with animals and studies with patients. For example, a unit of research beds to hospitalize cases of poorly understood types of deafness or vertigo was established in 1965.

Planning

A comprehensive program began early in 1965 to assess the state of knowledge in the field of communication and identify the areas needing special research attention. NINDB's National Advisory Council assigned the task to the newly organized National Advisory Council Subcommittee on Human Communication and Its Disorders. The fundamental nature of dizziness and nerve deafness is a target study.

Other Government programs on hearing, speech, and dizziness

The intimate relation between nerve deafness and dizziness produces an overlapping of research. Many programs with a primary target of problems of deafness become indirectly if not directly involved with dizziness.

Prevention and treatment, and the services to provide these for patients with neurological and sensory disorders are the goals of the Public Health Service's Neurological and Sensory Disease Service Program. To attain these ends, the Service Program works with official and voluntary health agencies, professional organizations, institutions of higher learning, and other nonprofit groups.

Children with deafness and other hearing disorders are assisted by the Children's Bureau. One goal is to locate handicapped children at increasingly younger ages, and to establish and expand preventive and remedial services for all ages of childhood. The Children's Bureau supports training programs in this field.

Rehabilitation of the deaf is given special emphasis in the improvement of vocational training programed by the Rehabilitation Services Administration. Programs of training and research in audiology and rehabilitation of deaf persons are supported.

Education of handicapped children, including the hard-of-hearing and the deaf, is an expanded

Federal effort conducted by the Office of Education. Its Captioned Films for the Deaf program is increasing the visual-aid services to the deaf. A new National Technical Institute for the Deaf in the Department of Health, Education, and Welfare was authorized by Congress in 1965 to provide technical training and education for high school graduates who are deaf.

Outside Government and the forward look

Research in dizziness and related subjects can be found in medical centers, medical schools, and both private and group practice of medicine and related professions. Whether support comes from Government agencies, voluntary associations, or altruistic individuals, the kinds of research related to dizziness will be similar to those already described. Official or nonofficial, research always seeks to identify, to understand, to prevent, to alleviate, and to cure.

A few definitions

acoustic nerve: 8th cranial nerve; combination of cochlear (hearing) and vestibular (balance) nerves.

acoustic neuroma: tumor involving acoustic nerve.

auricle: external ear.

cochlea: (L., "snail shell"); the portion of the inner ear containing the nerve endings for hearing.

cochlear duct: part of the membranous labyrinth within the cochlea, containing the end organ of the cochlear nerve.

cochlear nerve: one of two separate nerves of the 8th cranial nerve; transmits nerve impulses related to hearing between the cochlea and the hearing pathways of the brain. (An NINDB scientist discovered the feedback fibers from the brain to the cochlea, proving that hearing is a two-way system.)

dizziness: feelings of unsteadiness or whirling (see vertigo).

eighth cranial nerve: (acoustic nerve) consists of the two separate nerves of balance and hearing. They pass from the inner ear to separate areas of the brain.

endolymph: fluid within membranous labyrinth of inner ear.

endolymphatic hypertension: Meniere's disease; describes the kind of fluid (endolymph) involved with increased pressure (hypertension).

end organ: the nerve endings of hearing and balance.

exteroceptive senses: "outside" senses in skin, to recognize pressure on soles of feet, air pressure against body, to keep balance while running or walking against wind.

facial nerve: 7th cranial nerve; shares narrow passage through skull with acoustic nerve.

internal auditory canal: channel through skull containing acoustic and facial nerves and an artery.

labyrinth: inner ear; named from the loops and turns of the three semicircular canals and the snaillike cochlea.

labyrinthine hydrops: Meniere's disease; denotes location (labyrinth or inner ear) and organic symptom (hydrops or dropsy or accumulation of fluid).

labyrinthitis: inflammation of the nerve endings in the labyrinth of the inner ear.

mastoid area: spongy bone in the skull behind the external ear.

membranous labyrinth: located within bony structures of inner ear; contains fluid system and tiny nerve endings which are influenced by the fluid (endolymph) movement.

Meniere's disease: labyrinthine hydrops; endolymphatic hypertension; an inner ear ailment involving increased fluid pressure, often with symptoms of dizziness, ringing, and nerve deafness.

nystagmus: to-and-fro or rotary eye movements; pronounced nis-TAG-mus or nigh-STAG-mus.

otoliths: minute stones (otoconia or ear dust) mounted on the hairlike ends of nerve cells within the utricle and saccule.

otosclerosis: growth of new bone around the oval window, anchoring the footplate of the stapes and preventing this tiny bone from properly transmitting sound waves to the inner ear.

oval window: opening in bony wall of the inner ear; fenestra ovalis; fenestra vestibuli. The footplate of the stapes rests in this window.

perilymph: fluid surrounding and cushioning the membranous laybyrinth from the bony labyrinth; closely related to the cerebrospinal fluid.

proprioceptive system: muscle sense of position; part of sense of balance.

round window: membrane-covered opening in bony wall between inner and middle ears to help equalize fluid movements in inner ear; fenestra rotunda; fenestra cochleae.

saccule: membranous pocket off vestibule with nerve endings related either to balance or to hearing.

semicircular canals: upper portion (three semicircular canals) of inner ear containing nerve center for balance.

seventh cranial nerve: facial nerve; located beside the 8th cranial nerve within a narrow channel through the skull.

stapes: tiny stirrup-shaped bone in the middle ear, resting in the oval window. Its piston-like movement transfers the airborne energy of sound to the fluids of the inner ear.

tinnitus: ringing in the ear or head noises; pronounced tin-NIGH-tus or TIN-nit-tus.

utricle: membranous pocket off vestibule with nerve endings which signal acceleration.

vertigo (true vertigo): to whirl around; a feeling that the person is whirling, or his surroundings are whirling around him; pronounced VER-tig-oh, or ver-TIGH-go.

vestibular nerve: one of two separate nerves of the 8th cranial nerve; involved in maintaining balance.

vestibule: tiny oval cavity connecting the two major bony areas of balance and hearing; central area of membranous labyrinth.

Prepared by the Information Office
National Institute of
Neurological Diseases and Blindness
NATIONAL INSTITUTES OF HEALTH
Bethesda, Maryland 20014

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
U.S.A.

Public Health Service Publication No. 16
Health Information Series No. 139

Revised 1968

For sale by the Superintendent of Documen
U.S. Government Printing Office, Washington, D.C
Price 20 cents; $15 per 100 copies.

U.S. GOVERNMENT PRINTING OFFICE: 1968 O—307-075